Receiving Systems

The Racal RA6780 is a fully synthesized solid-state communications receiver designed for control via a digital interface with a local or remote manually controlled Receiver Control Unit. The receiver is suitable for all forms of reception and monitoring over the frequency range 1.5 to 30 MHz.

The RA6780 incorporates the very latest techniques in mixer and signal path development to produce performance with respect to dynamic range, intermodulation products, reciprocal mixing, cross modulation, blocking and spurious responses that far exceed any other receiver currently in production.

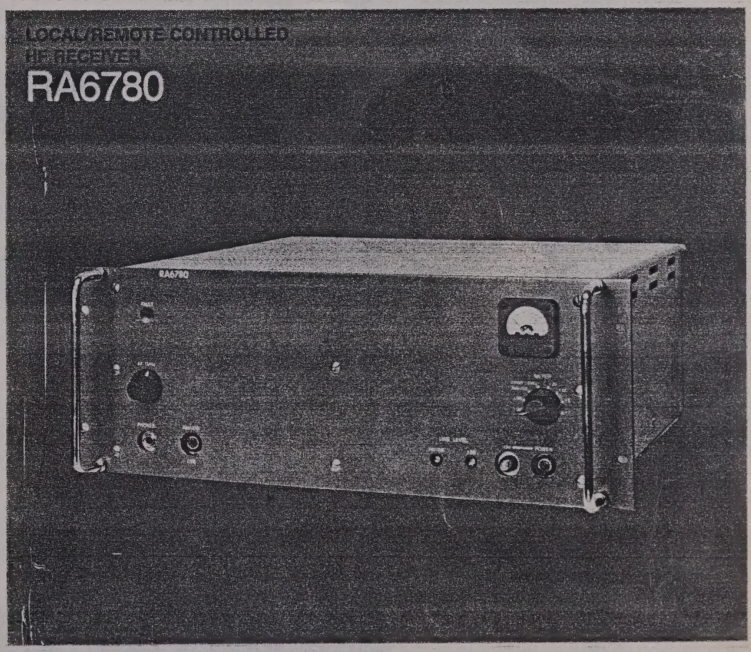
The high stability of the RA6780 is achieved by the frequency synthesizer which is referenced to a built-in frequency standard. Alternative standards are available as options, and the receiver can be operated from an external frequency source when required.

Comprehensive input and output connectors on the rear of the chassis permits diversity operation and the use of the receiver as the basis for sophisticated receiving systems.

Control of the RA6780 Receiver is via a serial asynchronous command word from either the Racal MA6001 or MA6002 manually operated Receiver Control Unit.

The RA6780 Receiver and MA6000 Series Receiver Control Units comprise a highly effective HF communications system for military, maritime and industrial high density links for medium and long haul traffic. The system may be configured for hard-wired local operation or remote operation via microwave links or telephone lines.

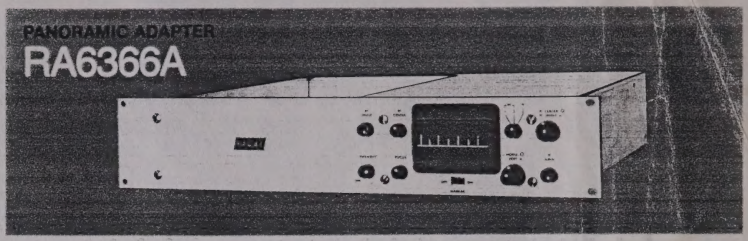
- Frequency range of 1.5-30 MHz
- Tuning increments in 10 Hz steps
- Stability of ± 1 part in 10^7
- Intermodulation (odd order intercept point) typically +40 dBm
- Unsurpassed signal path performance
- Built-in options for ISB, FSK and AFC operation
- Choice of alternate sideband and IF filters
- High MTBF – Low MTTR
- Excellent accessibility for maintenance
- Remote control via phone lines or microwave link
- Local control via Receiver Control Unit



- Up to 1 MHz wide display
- Wideband RF or narrowband IF displays
- Excellent resolution and sensitivity
- 5½" display length (Model RA6367)
- Marker indication of receiver setting

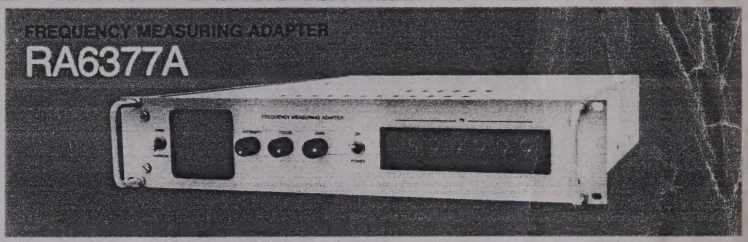
Ideal for search and monitor applications, the RA6366A is used with the RA6217 Receiver to provide a panoramic display of activity within a spectrum up to 1 MHz wide. Narrowband resolution allows two equal amplitude signals separated by only 1 KHz to be observed. Wideband operation will display two equal amplitude signals separated by at least 10 KHz. Typically, a 1 microvolt signal provides ¼ scale vertical deflection. A marker indicating receiver tuning and calibration markers (100 KHz intervals) may also be viewed on the CRT.

The Model RA6367 is essentially two RA6366 units built into one chassis with adjacent indicators to give an effective display length of 5 inches. It may be used with two receivers to display the same or different MHz bands.



- Provides off-the-air measurements
- ±2 Hz accuracy
- Measures AM, CW, FSK and SSB signals
- Displays frequency in Hz to 6 significant figures
- Lissajous pattern aids tuning

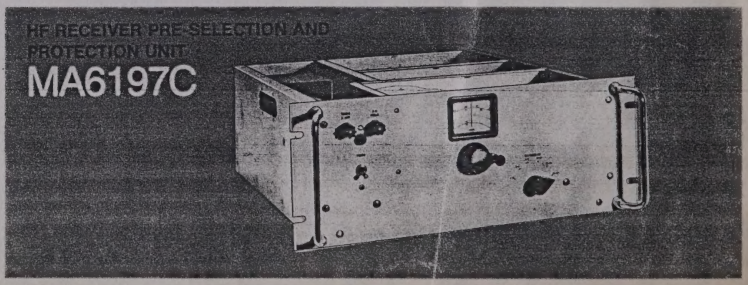
The RA6377A is an all solid-state unit designed for use in conjunction with most Racal HF Receivers to provide highly accurate off-the-air frequency measurements. The frequency measuring adapter includes a visual indicator for comparison of the measured frequency with the standard, and a six digit counter/readout for measurement of the KHz portion of the selected frequency. Aided by the Lissajous pattern, an operator can measure AM, CW, FSK and SSB modulated frequencies to within ±2 Hz. A precision 1 MHz frequency standard is included as an integral part of the RA6377A.

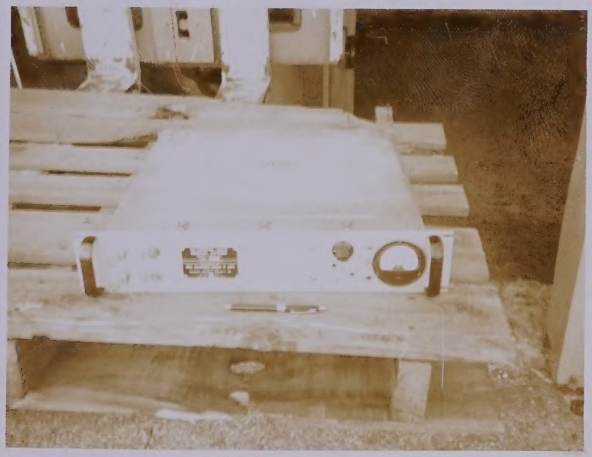


- 2 to 24 MHz
- High selectivity input circuits
- Virtually no effect on receiver sensitivity
- Protection against high input voltages
- Completely self-contained

The MA6197C allows receivers to be operated in close proximity to high power transmitters by reducing breakthrough and providing protection against antenna input overload conditions. It is particularly suitable for shipboard installations or where transmitting and receiving facilities are housed within the same building or vehicle.

Although the MA6197C may be used in conjunction with receivers operating between 1 and 30 MHz, full protection and pre-selection is effective only from 2 to 24 MHz. Highly selective, double-tuned input circuits provide 90 dB of attenuation to signals 5% off-tune without a reduction in overall gain, and causes only a slight effect on receiver sensitivity. It also provides protection against antenna input voltages up to 40V during overload conditions. This self-contained unit may be used with a single receiver or with multiple receivers being fed by a common antenna system.





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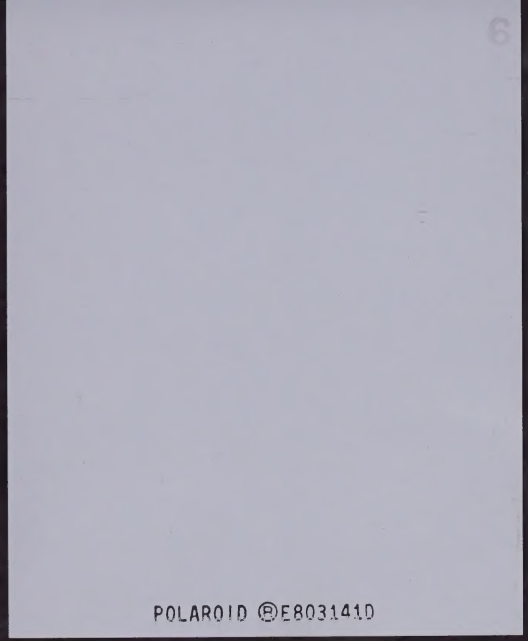
31-1050 Item 004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The Racal MA6001/MA6002 Receiver Control Units provide complete manual control and monitoring for Racal RA6780 Receivers.

The MA6001 Receiver Control Unit provides remote operation for a single RA6780 Receiver. The MA6002 Receiver Control Unit provides local control for up to 16 receivers.

The MA6001 and MA6002 units provide full control of the RA6780 Receiver by means of decade rotary switches for frequency, in 10 Hz steps, and rotary or toggle switches for mode, bandwidth and AGC functions. The receiver control units have built-in facilities to monitor receiver audio via a front panel speaker or phone jack, a VU meter, and rear panel terminal strip. These units also have a front panel fault indicator to display a receiver out-of-lock status. The MA6001 and MA6002 Receiver Control Units provide data in serial form, suitable for transmission over a normal voice frequency link which is compatible with the RA6780 Receiver interface circuitry.

- LOCAL or REMOTE operation for RA6780 HF Receivers
- Full control of receiver frequency, bandwidth, mode, AGC, and muting
- Provides tuning increments in 10 Hz steps
- High MTBF – Low MTTR
- Suitable for hard-wired, phone line or microwave link interfaces
- Excellent accessibility for maintenance

Receiving Systems

The RS6353 Multiple Channel HF/DF Receiving System provides instantaneous target acquisition and azimuth information for signals of interest in the 1 to 30 MHz frequency range.

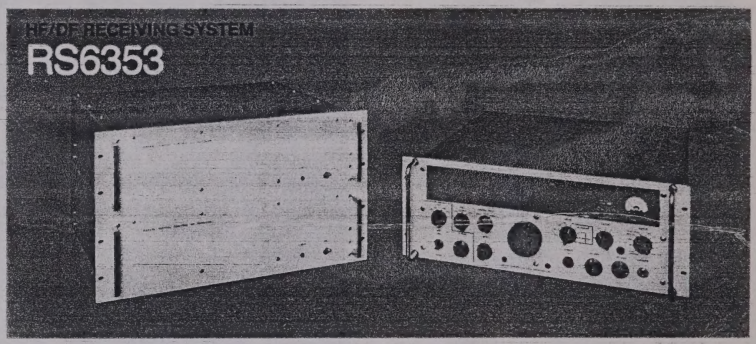
The RS6353 is designed to receive and amplify the low level RF signals to a useful level at the IF output suitable for operating a bearing indicator without significantly disturbing the relative phase or amplitude of the received signals. The close matching of the receiver channels holds for any frequency or gain setting and is maintained between the 3 dB points of any selected IF bandwidth.

The system is comprised of a Racal RA6772P Master Receiver and two or more RA6230 slave receivers to provide syncronously tuned receiver channels. The local oscillators of all receiver channels are coherent. The RS6353 is compatible with a wide variety of antenna systems and CRT bearing displays.

The RS6353 is equally suitable for use in complex multi-channel instantaneous DF systems and also in systems employing high speed goniometers. This application is catered for by the use of IF filters having closely controlled differential and absolute transit times such that the pulsed signal output (and associated sidebands) from the goniometer are delayed essentially equally over the chosen bandpass.

To enhance system versatility and flexibility a number of additional options are available including remote control of receiver frequency, bandwidth and gain as well as remote frequency readout via BCD command/monitor words.

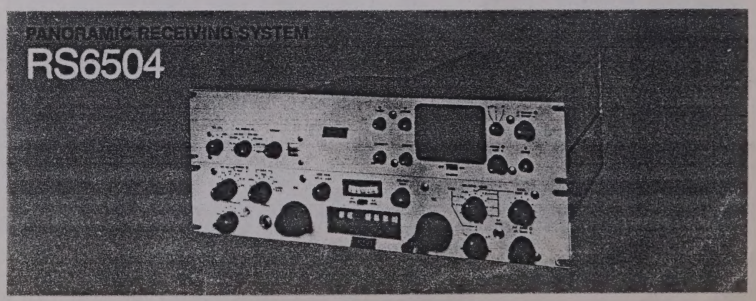
- Signal acquisition/monitor receiver
- Multiple slave DF channels
- 1-30 MHz frequency range
- AM, CW and SSB detection modes
- Video channel gain matching to within 1 dB over 100 dB dynamic range
- Phase matching better than 6 degrees
- Optional remote control
- Audio, IF and Video outputs



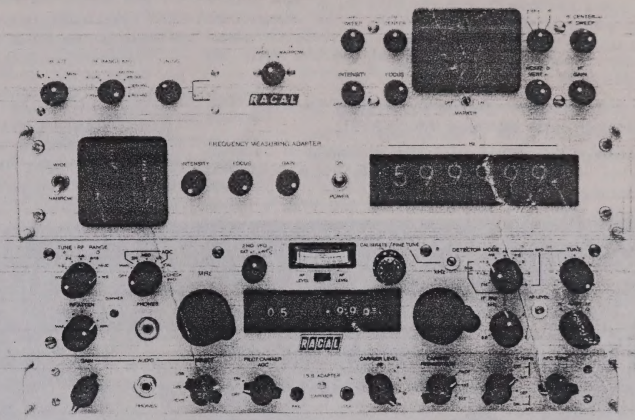
This versatile system, designed for monitoring, surveillance and signal analysis, provides a visual presentation of signal activity within selected portions of the HF spectrum. Standard frequency coverage is 1 to 30 MHz with an extension down to 3 KHz by using a low-frequency converter. Changeover to the converter is automatic when the receiver is tuned below 1 MHz. The RS6504 System combines a high performance RA6217 Receiver with a RA6366 Panoramic Adapter to provide AM, MCW, CW, SSB and FM operation.

An RF spectrum of up to 1 MHz bandwidth may be viewed, or the trace can be expanded to display any 100 KHz section of the selected 1 MHz band. Spectrum analysis of up to 75 KHz is available in the IF mode. Maximum resolution between two displayed signals is 1 KHz and the sensitivity is ample to distinguish clearly a 1 microvolt signal which typically results in a ¼ scale deflection.

- 1 MHz to 30 MHz with extension to 3 KHz
- Spectrum variable to 1 MHz bandwidth
- Wide and narrow panoramic display
- Clear indication of signals at 1 uV level
- Available with self-contained batteries



FREQUENCY MEASURING RECEIVING SYSTEM | RS 6551



FEATURES

- Average accuracy within 1 or 2 Hz
- Range 30 MHz to 1 MHz with extension to 3 kHz
- Sensitivity better than 0.5 microvolt
- Rapid and simple to operate
- All solid state

DESCRIPTION

The RACAL RS6551 Frequency Measuring System allows off-the-air measurement of the frequency of signals in the range of 1 to 30 MHz with an inherent accuracy of a few Hertz relative to true carrier frequency. Display of the received frequency takes the form of a large, clear in-line read-out. All measurement is referenced to a 1 MHz standard incorporated in the system. Facilities are provided for an external reference standard of higher accuracy if required.

System operation is extremely simple, allowing rapid measurement of signals, irrespective of modulation, to be performed by relatively untrained personnel. The operator merely selects and indicates the MHz element of frequency on the receiver MHz dial and then adjusts the kHz dial and the auxiliary fine tuning control for final setting. Exact setting is indicated on the RA6377 Frequency Measuring Adapter.

The basic system consists of an RA6217 HF receiver and a RA6377 Frequency Measuring Adapter. The receiver is a regular general-purpose version with a multi-turn fine tuning control added. The Frequency Measuring Adapter includes a visual indicator for comparison of measured frequency with the standard and a six digit counter for measurement of the kHz portion of the frequency. A precision frequency standard is also included as part of this unit.

For single sideband signals, the receiver may be provided with sideband filters to simplify demodulation and identification. Even with suppressed carrier SSB signals, direct measurement of any vestigial carrier is usually possible. Otherwise, careful and accurate setting of the receiver for optimum demodulation will give an accuracy of about 20 Hertz.

For independent sideband signals, an RA6298 ISB adapter can be employed. The addition of an RA6337 Low Frequency Converter extends the capability of the system to 3 kHz. The RA6366 panoramic display unit allows all activity in any given MHz segment to be viewed by the operator and provides, in addition, a narrow band mode for spectrum display of the IF output where high resolution is required.

The receiving equipment in the RS6551 system is standard in every major respect. It can therefore be used for normal reception in addition to its frequency measuring function, making it useful for back up purposes.

RACAL COMMUNICATIONS, INC.

MAY 1975

PRINCIPLE OF OPERATION

The antenna input circuit provides for either double-tuned preselection or wideband operation. After amplification, the incoming signal is fed to the 1st Mixer along with the output from the 1st VFO (MHz tuning). Although this oscillator is continuously tunable over the range 41.5 to 69.5 MHz, it should be noted that it is only effective at intervals of 1 MHz owing to the design of the overall mixing system. The output passed from 1st Mixer to the 2nd Mixer takes the form of a spectrum 1 MHz wide centered on 40 MHz.

The spectrum from 2nd Mixer (2nd IF) is then passed through a filter (2 MHz to 3 MHz BPF) to the interpolation section of the receiver. This uses a conventional superheterodyne arrangement incorporating the 3rd Mixer fed by the 2nd VFO.

The 2nd VFO, with a frequency range of 4.6 to 3.6 MHz, determines the kHz setting of the receiver.

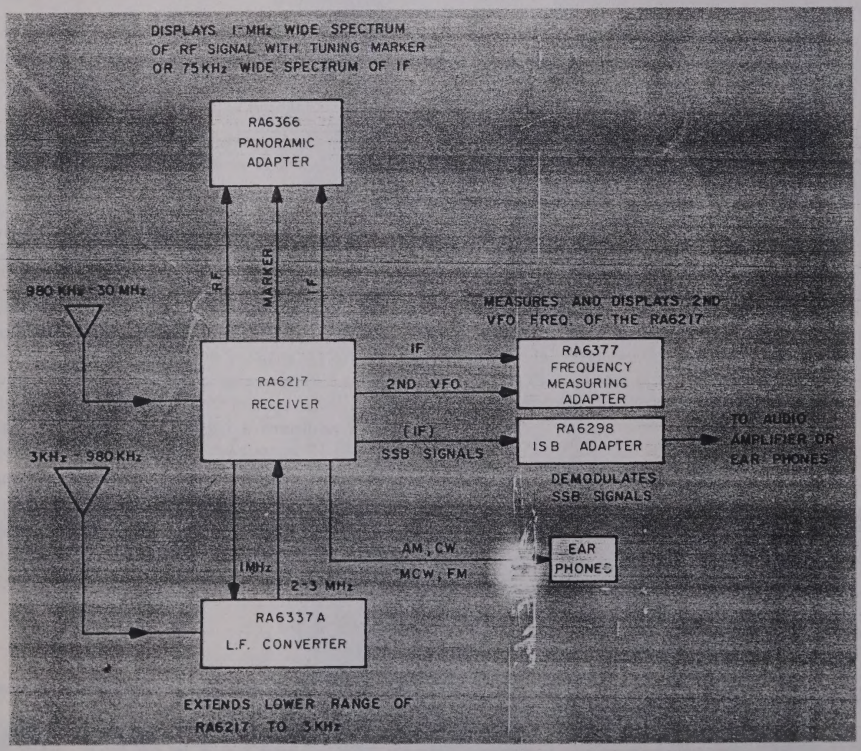
The injection oscillator of the interpolation receiver covers the frequency range of 3.6 to 4.6 MHz with 4.6 MHz corresponding to 000 and 3.6 MHz corresponding to 999 on the kHz dial. The output from the 2nd VFO is fed to the RA6377 Frequency Measuring Adapter where the frequency is measured by a digital counter; this counter is designed to read in terms of true received frequency instead of actual oscillator frequency. The counter derives its time base of 1 second from division of the 1 MHz standard. In operation the receiver is tuned to the chosen MHz number by means of its MHz dial, to the correct kHz number by means of the kHz dial of the receiver, and auxiliary fine tuning controlled for final setting. Correct tuning is indicated by means of a frequency comparator using a CRT Lissajous display which uses the IF output on one set of plates while the opposite set of plates uses a local signal exactly centered at the IF frequency. This signal is also derived from the 1 MHz standard. The operator selects the MHz number and tunes the kHz control until the Lissajous pattern is stationary. The received frequency is derived by the addition of the MHz dial reading of the receiver to the kHz number derived from the digital counter.

As an aid in measuring FSK signals, the comparator includes an optional narrow band filter having a bandwidth of about 8 cycles. When this filter is selected by its front panel control, the operator may measure both mark and space frequencies of the received signal.

The RA6337A Low Frequency Converter extends the low end of the band of the RA6217 from 980 kHz to 3 kHz. The RA6337 input circuits employ double-tuned band-pass filters which cover the 3 kHz to 980 kHz range in five bands. The 1st VFO of the RA6217 is cutoff when the RA6337A is used; the RA6377A output within the range of 2 to 3 MHz is fed to the interpolation receiver (2nd VFO) and the desired signal is selected by means of the kHz tuning control. The RA6298 ISB permits reception of SSB signals in conjunction with the RA6217 receiver; the RA6298 demodulates SSB signals of either 3 or 6 kHz bandwidth.

The RA6366 Panoramic Adapter provides a visual display of the received signal (1 MHz wide) with tuning marker, or the IF (75 kHz wide).

For display of a chosen MHz band, the RA6366 derives a signal from the 2 to 3 MHz output of the receiver and sweeps across that band showing all of the activity in the selected 1 MHz band. The RA6366 also includes a narrow band display deriving its input from the IF output of the receiver. In this case, the combination of the receiver and display unit is able to resolve two signals approximately 500 Hz apart.



RS6551 SIMPLIFIED BLOCK DIAGRAM

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Receivers

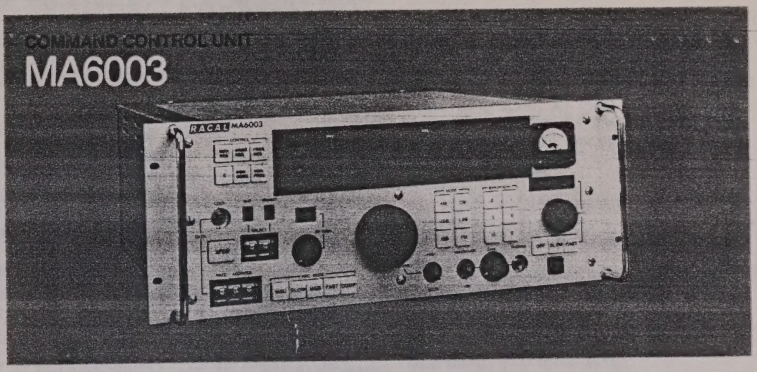
The MA6003 Command Control Unit (CCU) provides manual command and monitor functions under microprocessor control for 1 to 99 Racal RA6774 Computer Controlled HF Receivers. The CCU is also suitable for the control of any HF receiver employing standard RS-232, character oriented Type E format control words.

The MA6003 provides command and monitor capabilities for all receiver operating parameters either independently or collectively via illuminated front panel pushbutton controls and LED displays. Facilities are also provided for controlling ancillary devices such as antennas, recorders or special demodulators.

To enhance flexibility the CCU employs a microprocessor permitting optional operating features such as receiver frequency scan lock on signal presence and interface with keyboards, hardcopy readout equipment or teletype terminals.

The MA6003 is a versatile receiver control unit for system operation and diagnostic routines, and provides a viable alternate for redundant system computers.

- Command and monitor one to ninety-nine receivers
- Local and remote operation modes
- RS-232 Interface
- Provides "System Failsafe" capabilities
- Ancillary device control
- Microprocessor design



The RA6337 Low Frequency Converter has been specially developed for use with the Racal RA6217 series of HF Communications Receivers to extend the frequency coverage from 980 KHz down to 3 KHz. The unit is designed to combat the effects of cross-modulation, intermodulation and blocking from high-power broadcast stations. Additionally, the unit is particularly effective in minimizing interference in LF reception.

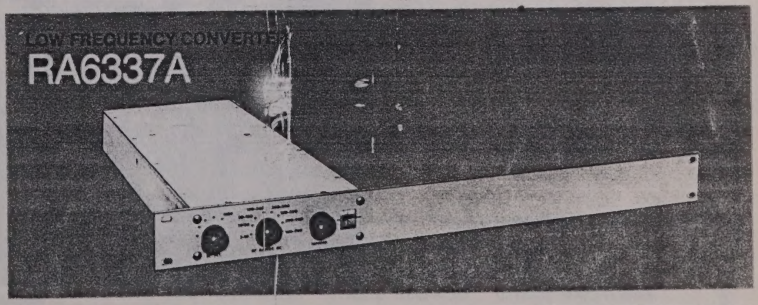
The performance of the associated receiver is not impaired by the presence of the LF converter which may be left permanently connected. Changeover to LF operation is automatically effected by the LF setting of the MHz control (i.e. 00) of the receiver.

The input circuits employ double-tuned band-pass filters which cover the frequency range in five bands. These are manually tuned using a frequency-calibrated drum indicator operated by a slow motion drive. In addition, wideband input circuits can be selected incorporating filters to attenuate broadcast band interference. The input circuits incorporate protection against damage by high level signals and lightning surges.

The converter produces an output spectrum of signals within the range 2 to 3 MHz which is fed to the interpolation section of the associated receiver; the desired signal is then selected by means of the KHz control.

Outstanding Features

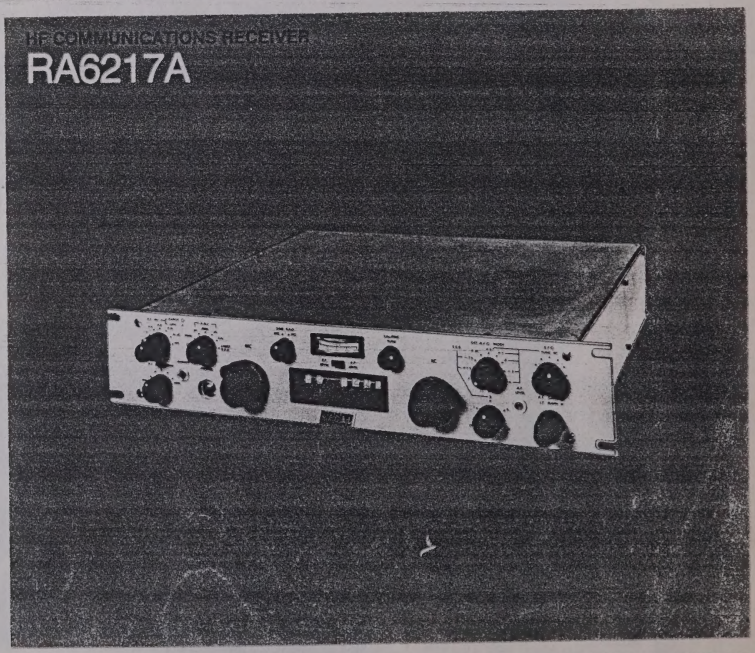
- Frequency range from 3 KHz to 980 KHz
- Protected against antenna overload
- Tuned pre-selection or wideband operation
- Does not affect HF receiver performance
- All solid-state design



- Continuous coverage from 980 KHz to 30 MHz
- Drift-cancelling electronic band switching
- Switched selection of 5 IF bandwidths
- Exceptional performance and stability
- Facilities for synthesizer or other external control
- Equipped for diversity operation

HF COMMUNICATIONS RECEIVER

RA6217A



This superbly designed receiver uses the Wadley drift-cancelling frequency selection system exemplified in its world-famous predecessor, the Racal RA17 Receiver. The incorporation of solid-state circuitry has even further improved the performance of the RA6217A which features continuous tuning using electronic band selection to eliminate mechanical switches and complex wiring.

Suitable for AM, SSB (upper and lower), CW, MCW and FM reception, frequency ranges are selected in discrete 1 MHz bands between 1 and 30 MHz with a 20 KHz overlap provided at each end of the frequency scale. Switched bandwidth selection of 13, 6, 3, 1 and 0.2 KHz is available. All IF filters are designed as interchangeable units.

Excellent long term stability of ±50 Hz (±5 Hz short term) and high accuracy of frequency settings obtainable with the easily read in-line digital frequency display insures trouble-free operation under the most difficult receiving conditions. A built-in calibrator and precise fine adjustment control facilitates rapid calibration and zeroing of the frequency scale.

Alternative Models

RA6217B. This version offers the maximum versatility in tuning methods. Frequency setting is available with synthesizer operation or continuously variable manual control. MHz selection is derived from switched crystal oscillators the use of which also enhances the noise performance in the presence of strong signals. The unit has switch contacts for the RA6397 Antenna Filter Unit and can act as master to the RA6217F slave receiver.

RA6217D. This receiver is designed primarily for remote-controlled operation. MHz selection uses switched crystal oscillators. All frequency setting is by synthesizer which can also actuate an RA6397 Antenna Filter Unit. The RA6217D may be used as master with the RA6127F.

RA6217E. This version has a selector switch coupled to the MHz setting (for the RA6397 Antenna Filter Unit) and an additional 1.6 MHz IF output of 75 KHz bandwidth to make it particularly suitable for panoramic reception.

RA6217F. Designed for use as a slave receiver, this unit contains no local oscillators. These are replaced by buffer amplifiers which are fed from the master receiver.

RA6217Q. This receiver, which is suitable for pre-detection recording, has a wide-band IF output with a bandwidth of 100 KHz centered on 70 KHz. No detectors or AF circuits are provided.

SPECIFICATIONS

Frequency Range:
980 kHz to 30 MHz

Modes of Reception:
AM, SSB, CW, MCW, FM

Sensitivity (3 kHz bandwidth):
CW, SSB: 0.5 microvolts for 15 dB signal-to-noise ratio
MCW, AM (30% mod): 1.5 microvolts for 15 dB signal-to-noise ratio
FM (13 kHz bandwidth): 1 microvolt input for 20 dB quieting. 10 kHz peak-to-peak deviation for 10mW AF output

Noise Figure:
Less than 11 dB throughout

Input Impedance:
50-75 ohms (nominal)

RF Input Attenuator:
0 to 40 dB nominal in 10 dB steps

Oscillator Radiation at Antenna Terminal:
Less than 5 microvolts in 75 ohms

Tuning:
Continuous tuning with digital presentation of MHz and kHz and interpolation scale down to 200 Hz

Frequency Setting Accuracy:
Within 500 Hz

Calibration:
Internal calibrator unit provides marker signals at 100 kHz intervals

Stability:
Long Term: ± 50 Hz per 8 hour period at constant ambient temperature
Short Term: ± 5 Hz at constant ambient temperature
Variation with Temperature: Typically less than 50 Hz per °C

Selectivity:
13, 6.0, 3.0, 1.0 kHz and 200 Hz (nominal at 3 dB points)

Shape Factor (6-60 dB):
1:4 or better (1:10 for 200 Hz bandwidth)

IF Outputs:
2-3 MHz broad-band spectrum for panoramic display
1.6 MHz, 100 mV nominal in 75 ohms (after IF selectivity)
455 kHz, 200 mV nominal in 50 ohms (100 kHz to customer order)

Automatic Gain Control:
Range: Input variation of 80 dB causes no more than 3 dB change in output
Time Constants (nominal):
Short: charge, 16 milliseconds; discharge, 30 milliseconds
Medium: charge, 50 milliseconds; discharge, 200 milliseconds
Long: charge, 80 milliseconds; discharge, 4 seconds

BFO Range:
Continuously variable, ± 3.5 kHz from switched setting at IF + 6, IF + 3, 0, IF − 3 and IF − 6 kHz
Fixed crystal-controlled points at IF + 1.5 and − 1.5 kHz

Spurious Response to External Signals:
Better than 60 dB down for signals less than 10% off tune
Better than 80 dB down for signals more than 10% off tune

Internally Generated Spurious Signals:
Below noise when measured in a 3 kHz bandwidth, except at 1.0 MHz where response can be 5 dB above receiver noise

Image Rejection:
80 dB or better

Out-of-Band Intermodulation Distortion Products:
With the preselector tuned to the wanted frequency, the level of two equal unwanted signals more than 10% removed from the wanted frequency must be at least 80 dB above a 0.5 microvolt reference to produce a signal equivalent to the reference level

In-Band Intermodulation Distortion Products:
40 dB or more below two desired 3 millivolt input signals within the receiver passband, extended to 300 millivolts with use of the antenna attenuator

Cross Modulation:
For wanted signal levels up to 0.5 millivolts and with appropriate use of the antenna attenuator, a 30% modulated interfering signal 1.33% removed must normally have a level 46 dB above the wanted signal to produce cross modulation of 3%. The ratio improves at a rate of approximately 2 dB for each percent up to 10% off tune

Meter Indication:
RF tuning indicator; AF level to line

AF Output:
10 milliwatts (600 ohms) to headphone jack and rear terminals
Independent 1.0 milliwatt (600 ohms) output to line at rear terminals

AF Response (Overall):
To correspond with IF bandwidth in use and maintained to within 3 dB down to 300 Hz

AF Distortion (Overall):
Typically less than 2%

Controls:
MHz tuning, kHz tuning, RF range, RF tuning, RF attenuator, RF/IF gain, System switch, IF bandwidth, Detector mode switch, Calibrate/fine tune, Tuning lock, BFO tune, AF gain, Dimmer (preset), Meter switch, AF line level (pre-set), VFO internal/external switch

Power Supplies:
(Optional plug-in Units)
MA 6302: 100-125 and 200-250v, 48-420 Hz, 10VA (approx.)
MA 6301: 11-30v DC (positive or negative grounded)
MA 6300: Combined AC power supply/battery charger for use with MA6704 Ni-Cad battery pack

Environmental Conditions:
Operating: 0°C to + 55°C
Storage: − 40°C to + 70°C

Dimensions:
3½" high x 19" wide x 17" deep

Weight:
25 pounds (approx.)

Specifications subject to change without notice.

ALTERNATIVE MODELS

The success of the RACAL RA6217 in so many fields of HF reception has resulted in the development of a number of alternative models.

RA6217A This is the version of the RA6217 receiver described and specified in this publication.

RA6217B This version offers the maximum versatility in tuning methods. Frequency setting is available with synthesizer operation or continuously variable manual control. MHz selection is derived from switched crystal oscillators, the use of which also enhances the noise performance in the presence of strong signals. The unit has switch contacts for the RA6397 Antenna Filter Unit and can act as master to the RA6217F slave receiver.

RA6217D This receiver is designed primarily for remote-controlled operation. MHz selection uses switched crystal oscillators. All frequency setting is by synthesizer which can also actuate an RA6397 Antenna Filter Unit. The RA6217D may be used as master with the RA6217F.

RA6217E This version has a selector switch coupled to the MHz setting (for the RA6397 Antenna Filter Unit) and an additional 1.6 MHz IF output of 75 kHz bandwidth to make it particularly suitable for panoramic reception.

RA6217F Designed for use as a slave receiver, this unit contains no local oscillators. These are replaced by buffer amplifiers which are fed from the master receiver.

RA6217G The operation of this version (primarily for SSB communication) has been simplified by combining mode and bandwidth selection. The five available modes are AM (8 kHz), USB (3 kHz), LSB (3 kHz), and CW (1000 Hz and 200 Hz).

RA6217Q This receiver, which is suitable for pre-detection recording, has a wide-band IF output with a bandwidth of 100 kHz centered on 70 kHz. No detectors or AF circuits are provided.

RACAL

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HF COMMUNICATIONS RECEIVER | RA6217

FEATURES

- **Continuous coverage from 980 kHz to 30 MHz**
- **AM, SSB, CW, MCW, and FM reception**
- **Exceptional sensitivity and stability**
- **All solid-state**
- **Drift-cancelling electronic bandswitching**
- **Can be used with synthesizer**

DESCRIPTION

In the RA6217 receiver, Racal has once more successfully applied the Wadley drift-cancelling frequency selection system exemplified in its world-famous predecessor, the Racal RA17. The introduction of solid-state circuitry has even further improved the performance of the system, which features continuous tuning using electronic band selection to eliminate switches and remove complex wiring. These features have resulted in a high-grade, solid-state HF communications receiver, covering a frequency range from 1 to 30 MHz, developed to meet the most exacting performance requirements. The range is selected in discrete 1 MHz bands, with a 20 kHz overlap beyond each end of the scale.

The receiver is suitable for operation in the AM, SSB (upper or lower sideband), CW, MCW and FM modes. Switched selection of five IF bandwidths is available. All IF filters are designed on an interchangeable basis.

The excellent frequency stability of this receiver and the high accuracy of setting obtainable with the easily read in-line digital frequency display insures trouble-free operation even under the most difficult reception conditions. Calibration and zeroing of the frequency scale is rapidly accomplished by use of a built-in calibrator circuit and precise fine adjustment control.

The RA6217 is designed for a low power consumption. Interchangeable power supply units are available for use from AC line supplies or low voltage DC sources. A nickel cadmium battery pack is available which, with an AC charger unit, enables the receiver to be operated independently of line supplies.

The receiver, designed to meet the stringent environmental requirements of the Armed Forces, is strongly constructed using the highest quality components. Modular construction is used throughout, with plug-in connections to ensure the maximum accessibility and the minimum possible repair time.

RACAL COMMUNICATIONS, INC.

MAY 1975

Receiving Systems

The RS6555 Receiving System is a versatile arrangement of equipments designed for comprehensive spectrum analysis and monitoring applications. The system covers the frequency range of 3KHz to 1GHz through the implementation of independent LF/MF/HF and VHF/UHF receivers.

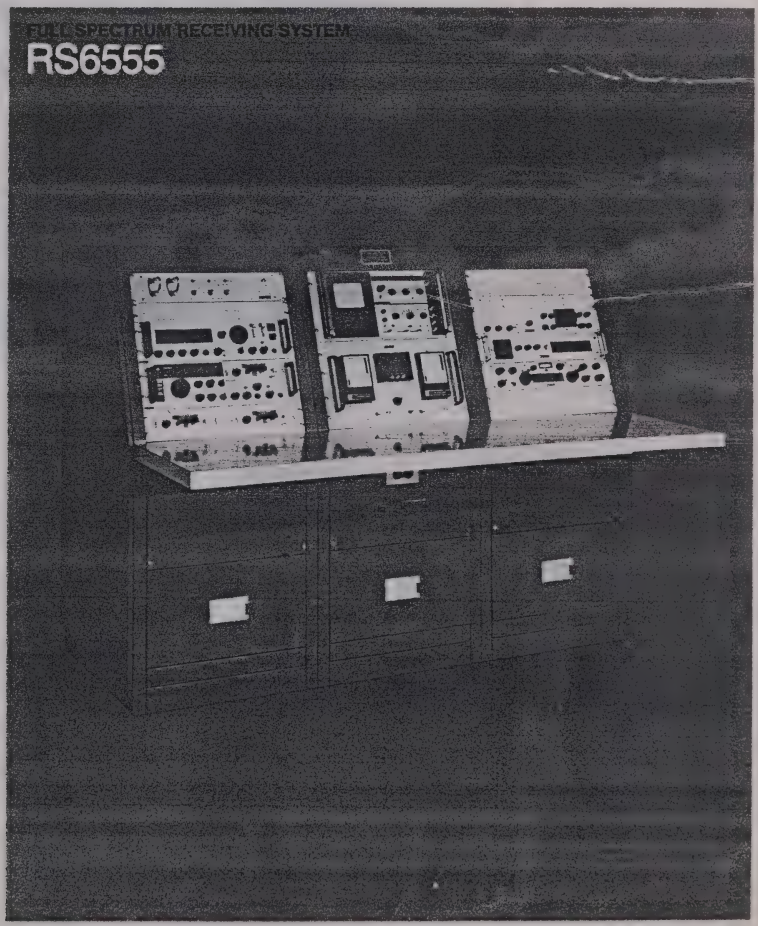
The LF/MF/HF portion of the system depicted below employs the RA6217 HF Receiver in conjunction with the RA6337 LF Converter, RA6366, RF/IF Pan Adapter and RA6377 Frequency Measuring Unit. The VHF/UHF elements of the system consist of the RA2091 Synthesized VHF/UHF Receiver Main Frame, RA2090 Series plug-in VHF/UHF Tuning Heads and the RA2092 Signal Display/ Audio Unit. These equipments cover the frequency range of 20 to 1000 MHz using three plug-in tuning heads.

To enhance versatility and flexibility a spectrum analyzer, Time-of-Day digital clock dual chart recorder and antenna select/ Patch panel are provided.

The system console provides comprehensive input/output facilities for RF, IF, and Audio Signals as well as built-in power distribution panels and storage drawers.

Complete details for equipment specifications and system configurations are available on request.

- 3kHz to 1gHz Frequency Range
- AM, FM, CW, SSB Detection modes
- Independent Modular Construction
- Synthesized VHF/UHF Receivers
- Conventional VFO or Synthesized LF/MF/HF Receivers
- Spectrum Analyzer, Time-of-Day and Recording ancillary equipment provided
- Available with wide variety of options



This precision frequency measuring system is designed to perform highly accurate off-the-air measurements of received frequencies to within a few cycles. Measurements are referenced to a 1 MHz internal standard to provide an accuracy better than 5 parts in 10^9 per day for a total system accuracy of better than ±2 Hz

The basic system, consisting of an RA6217 Receiver and a RA6377 Frequency Measuring Adapter, measures signals from 1 to 30 MHz with an extension to 3 KHz by the addition of a RA6337 Converter. The RA6377 provides a Lissajous pattern to facilitate tuning with the measured frequency being displayed in Hz to six significant figures. An RA6366 Panoramic Adapter may be incorporated into the system for spectrum analysis, if desired.

The RA6217 employed in the system is standard in every major respect and may be used as a general purpose receiver making it a potential backup receiver for SSB, FM, AM, CW and MCW reception

- Average accuracy ±2 Hz
- 30 MHz to 1 MHz with extension to 3 KHz
- Better than 0.5 microvolt sensitivity
- Rapid and simple to operate

SYSTEM MODEL NUMBER OPTIONS

System Model No.	Receiver RA6217	Comp/ Counter RA6377	RA6337 LF Conv	RA6366 Display	RA6298D ISB Adapter
RS6551A	X	X			
RS6551B	X	X		X	
RS6551C	X	X	X		
RS6551D	X	X	X	X	
RS6551E	X	X			X
RS6551F	X	X		X	X
RS6551G	X	X	X		X
RS6551H	X	X	X	X	X

TECHNICAL DESCRIPTION

■ The novel frequency converting circuit of the RA6217 series of Receivers allows the RA6366 to use the wide band intermediate frequency (2 to 3 MHz) to display a spectrum of up to 1 MHz in width.

■ In the IF mode, the Adapter is fed with a spectrum of 13 kHz bandwidth at 1.6 MHz. The RA6217E Receiver has a 1.6 MHz output with 75 kHz bandwidth permitting a wider spectrum to be analyzed. The RA6366B-1 unit incorporates a switch to select the narrow or wide band IF mode of operation.

■ A sawtooth generator, which provides the 'X' deflection for the cathode ray tube, drives the two respective sweep oscillators for the RF and IF modes. The output from one of these oscillators is mixed with the wide or narrow band IF from the receiver according to the selection of RF or IF mode; signals appearing at the mixer output will thus depend on the instantaneous frequency of the sweep oscillator and consist successively of the signal levels occurring in the spectrum under observation. These appear in the final IF of 455 kHz and, after suitable band-pass filtering, are rectified, amplified, and applied to the 'Y' plates of the cathode ray tube.

■ Part of the output of the receiver 2nd VFO is also mixed with the output from the sweep oscillator using the resulting output to initiate a trace marker which shows the point to which the receiver is tuned. Alternatively, a harmonic generator can be switched into circuit to produce markers to calibrate the trace at 100 kHz intervals.

■ Power for the RA.6366 can be derived from the associated receiver. The RA.6367, however, has its own self-contained power unit and is operated from regular line supplies.

TECHNICAL SPECIFICATIONS

(The use of a Racal RA6217 series Receiver is assumed where applicable)

OPERATION:
a) RF Mode: Panoramic display up to 1 MHz wide
b) IF Mode: Spectrum analysis facilities of up to 75 kHz bandwidth centered on the receiver tuned frequency

INPUT FREQUENCIES:
RF Mode: 2-3 MHz
IF Mode: 1.6 MHz, 75 kHz bandwidth

SWEPT FREQUENCY RANGE:
RF Mode: Adjustable from 100 kHz to 1 MHz
IF Mode: Adjustable from 7.5 kHz to 75 kHz

RESOLUTION:
RF Mode: Separates two equal amplitude signals 10 kHz apart
IF Mode: Separates two equal amplitude signals 1 kHz apart

SWEEP RATE:
4 per second (approx)

FREQUENCY MARKERS:
RF Mode: (a) Movable marker indicates receiver tuned frequency
(b) At fixed 100 kHz intervals across spectrum
IF Mode: IF center frequency

SENSITIVITY:
Normally ¼ scale deflection for 1 microvolt input signal depending on type of associated receiver.

SPURIOUS RESPONSES:
At least 50 db below deflection level of a 1 microvolt input signal

DISPLAY:
Rectangular cathode ray tube (2¾" x 1⅛")
RA.6366: Single tube
RA.6367: Two tubes (total screen length 5½")

POWER SUPPLY:
RA.6366: Derived from receiver
(a) — 16 volts DC regulated, 135 ma (nominal)
(b) 21 to 40 volts DC unregulated, 205 ma (nominal)
RA.6367: Self-contained power supply unit operating from AC line supply:
100-125 v and 200-250 v, 48-420 Hz

ENVIRONMENTAL CONDITIONS:
Temperature: 0°C to 55°C Operating
— 40°C to 70°C Storage
Altitude: 10,000 feet Operating
30,000 feet Storage

DIMENSIONS:
RA.6366M: 3½" high x 8¼" wide x 16" deep
RA.6366A & B: 3½" high x 19" wide x 17" deep
RA.6367: 3½" high x 19" wide x 17" deep
RA.6503: 3½" high x 19" wide x 17" deep

WEIGHTS:
RA.6366M: 12 pounds (approx)
RA.6366A & B: 14 pounds (approx)
RA.6367: 27 pounds (approx)
RA.6503: 19 pounds (approx)

The RACAL policy is one of continuous improvement, consequently the equipment may vary in detail from the description and specification in this publication.

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PANORAMIC ADAPTER SPECTRUM DISPLAY UNIT

RA 6366 RA 6367

OUTSTANDING FEATURES

RA6366/RA6367

- Spectrum continuously variable to 1 MHz bandwidth
- Wide band RF and narrow band IF indication
- Clear indication of signals at 1 microvolt level
- Simultaneous spectrum display and signal analysis
- Marker indication of receiver setting

RA6366 PANORAMIC ADAPTER
SPECTRUM DISPLAY UNIT

RA6367

- Displays a 1-MHz RF spectrum over an effective length of 5¾ inches (two CRT)
- Displays RF and IF spectrums simultaneously
- Displays 1-MHz RF spectrum from two receivers

RA6367 DUAL-PANORAMIC
ADAPTER DISPLAY UNIT

■ The RA6366 and RA6367 Panoramic Adapter Spectrum Display Units are used with the RACAL RA6217 series* of high-frequency receivers to provide a visual display of RF and IF signals between 980 kHz to 30 MHz (extended down to 3kHz with use of the RA6337 Low-Frequency Converter).

■ The RA6367 is essentially two RA6366 units built into one chassis; two CRT's (2¾" x 1⅛") are arranged adjacent to each other to give an effective display length of 5½ inches.

■ The RF-1 mode (narrow band) provides for the resolution of two RF signals separated by 1kHz or more at a RF sweep width of 100 kHz (adjustable). The RF-2 mode (wideband) provides for the resolution of two RF signals separated by 10 kHz or more at a RF sweep width of 100 kHz to 1MHz (adjustable). The frequency spectrum to be displayed is selected by the MHz tuning control of the receiver.

■ The IF mode provides for the resolution of two signals separated by 1kHz or more at an IF sweep width adjustable to 75 kHz. The frequency spectrum to be displayed is selected by the kHz tuning control of the receiver.

■ A marker showing the frequency to which the receiver is set permits the operator to select any part of the wide band spectrum for examination. Markers are also available at 100 kHz intervals and at the center IF frequency.

■ The RA6367 may be used with two receivers to display different MHz bands or, by presenting the first 500 kHz on the left and the remaining 500 kHz on the right, to show a 1 MHz spectrum over the double screen length. It also has the unique capability of permitting any selected signal to be analyzed in a narrow band IF mode while retaining the display of the wide band RF spectrum on the other trace.

■ The basic RA6366M occupies a half rack-width. The standard unit, RA6366A, is mounted on a 19 inch panel 3½ inches high with a supporting framework suitable for carrying slides. The RA6367 occupies the full 19 inch rack width with the same panel height. A combination of the RA6366 with an RA6337 L.F. Converter on a single panel is available as an RA6503 Converter/Display Unit.

*Also compatible with other RACAL receivers.

RACAL

COMMUNICATIONS, INC.

Publication No. 236U2

SPECIFICATIONS

★RS6551 FREQUENCY MEASURING SYSTEM (Overall)

Frequency Range:
RS6551A/B/E/F – 980 kHz to 30 MHz
RS6551C/D/G/H – 3 kHz to 30 MHz

Sensitivity:
Accurate indication with signal levels lower than 0.5 microvolts (wide-band), 0.25 microvolts (narrow-band)

Accuracy:
Internal Frequency Standard Reference – 5 parts in 10^9 per day (optionally 1 in 10^9). Total system accuracy better than ±2 Hz

Indication:
Nixie tube latched display in digits (0 to 999.999 kHz)

Power Supply:
100-125 and 200-250v, 48-420 Hz, 70 VA (approx.)

Environmental Conditions:
Operating Temperature: 0°C to +50°C
Storage Temperature: –25°C to +70°C
Relative Humidity: zero to 95%

Dimensions:
RS6551A: 7" high x 19" wide x 20" deep
RS6551B, D, G: 10½" high x 19" wide x 20" deep
RS6551C, E: 8¾" high x 19" wide x 20" deep
RS6551F, H: 12¼" high x 19" wide x 20" deep

Weights: (approx.)
RS6551A: 55 pounds
RS6551B: 60 pounds
RS6551C, F, G: 70 pounds
RS6551D: 75 pounds
RS6551E: 65 pounds
RS6551H: 85 pounds

★RA6337 LF CONVERTER
See data sheet.

★RA6366 PANORAMIC ADAPTER
See data sheet.

★RA6377 FREQUENCY MEASURING ADAPTER
See data sheet.

★RA6217 HF RECEIVER
See data sheet.

★RA6298 ISB ADAPTER
See data sheet.

SYSTEM MODEL NUMBER OPTIONS

System Model No.	Receiver RA6217	Comp/Counter RA6377	RA6337 LF Conv	RA6366 Display	RA6290D ISB Adapter
RS6551A	X	X			
RS6551B	X	X		X	
RS6551C	X	X	X		
RS6551D	X	X	X	X	
RS6551E	X	X			X
RS6551F	X	X		X	X
RS6551G	X	X	X		X
RS6551H	X	X	X	X	X

Specifications subject to change without notice.

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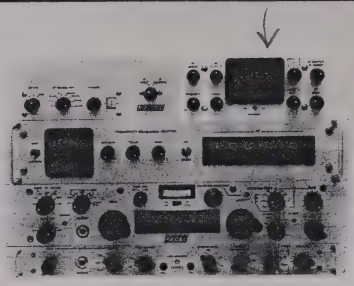
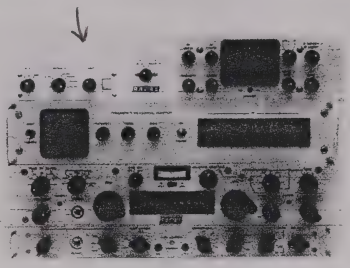
RA6366 PANORAMIC ADAPTER



The RA6366 is designed for use in conjunction with the RA6217 receiver to provide a panoramic display of received signals in a spectrum up to 1 MHz wide. Facilities are incorporated to indicate on the display the exact frequency to which the receiver is tuned and for calibration markers to be shown at 100 kHz intervals.

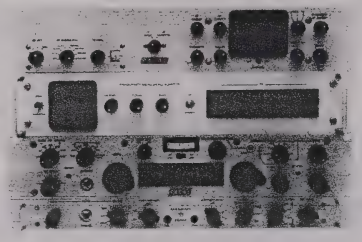
Alternatively, the adapter will provide spectrum analysis of received signals over a frequency band of up to 75 kHz width centered on the receiver tuned frequency. The center frequency of this spectrum can be identified by a marker signal.

RA6337 LOW QUENCY CONVERTER



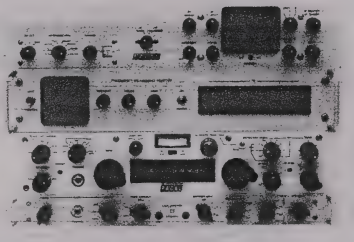
The RA6337 is an all solid state unit which extends the lower frequency limit of the RA6217 receiver from 980 to 3kHz. The converter incorporates double-tuned antenna circuits combined with a low-pass filter specially designed to combat interference from high-power stations in the broadcasting band. Employing the same high-accuracy reference frequency source as the RA6217 receiver, the frequency accuracy and stability offered by the RA6337 is equal to that available in the HF ranges. A clear-vision drum tuning scale with slow-motion drive facilitates accurate tuning of the antenna circuit.

RA6377 FREQUENCY MEASURING ADAPTER



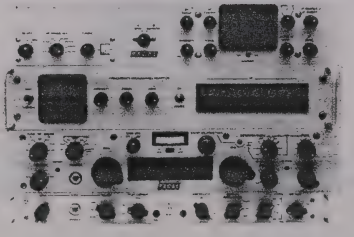
The RA6377 is an all solid state unit designed to be used with the RACAL RA6217 Receiver as a highly accurate off-the-air frequency measuring system. The RA6377 measures frequencies of AM, CW, FSK, and SSB signals and displays the measured frequency in Hz to six significant figures. Tuning is aided by a Lissajous pattern display on the CRT.

RA6217 HF COMMUNICATIONS RECEIVER



The RA6217 series of receivers are of solid state design covering a frequency range 1 to 30 MHz. They incorporate facilities for operation in AM, SSB, MCW and FM modes with switched bandwidth selection of 13, 6, 3, 1 and 0.2 kHz. Versions are available for continuous manual control or synthesizer operation with optional remote control. The RS6504 Panoramic Receiving System is a typical example of the flexibility of this series. Maximum versatility of performance (including the capability to operate in master/slave configurations) is obtained by the utilization of the wide range of available add-on units.

RA6298 INDEPENDENT BAND (ISB) ADAPTER

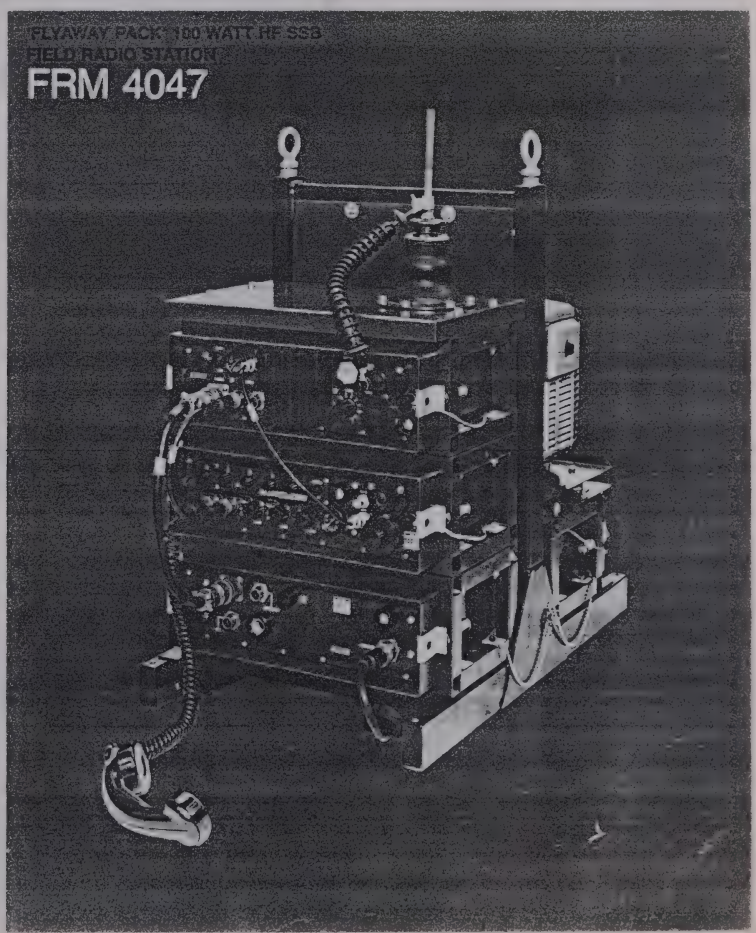


The RA6298 is a solid state unit that permits reception of sideband signals through the IF output of the RACAL RA6217 series of receiving or comparable receivers. The RA6298 is provided with electronically-operated automatic-frequency control (AFC) that includes a memory-device. The Automatic Gain Control (AGC) circuit permits control of the receiver from a combination of pilot carrier level and the composite sideband signal level.

The FRM 4047 'Flyaway Pack' is designed to meet the increasing demand for a low-cost, compact and self-contained HF radio station for military or commercial applications. A power output of up to 100 watts is available from the station which comprises the well proven TRA 931 'Syncal 30' manpack transceiver plus a TA 944 100 watt linear amplifier, MA 4013 18 volt rechargeable battery, MA 4012 battery charger and an integral MA 4101 gasoline-electric generator. The units are securely mounted on a rigid, square section, tubular steel frame. The station is intended primarily for SSB operation with upper or lower sideband selectable by the operator However, facilities are also included for AM and CW operation on any one of the 28,400 synthesizer-controlled channels provided within the 1.6 to 30 MHz frequency range.

The 'Flyaway Pack' is simple to operate and maintain; its modular construction ensuring simple interchange of similar units in the field. The incorporated TA 944 linear amplifier is the only amplifier of its type to include a built-in antenna tuning unit which will match into the 16 ft. whip antenna supplied and end fed antennas or dipoles and the overall size, weight, complexity and cost of a complete 100 watt radio communications system is thus greatly reduced. The complete station can be housed within a purpose-built container provided with knock down sides to allow instant access

- Complete self-powered transmitter/receiver station
- Easy to handle and transport
- 1.6 to 30 MHz synthesizer control
- Solid state—100 watts output
- Simple operation and maintenance
- USB/LSB/AM—Voice or keyed tone
- Rugged and reliable



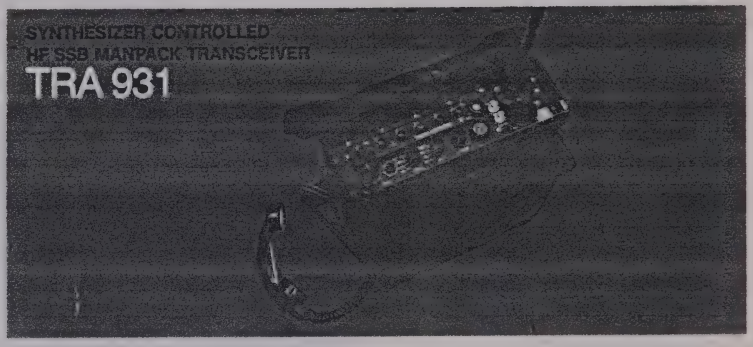
Transceivers

The TRA 931 'SYNCAL 30,' a high performance manpack transceiver designed to satisfy both military and civil communications is also readily adaptable for fixed and vehicle mounted applications. This HF SSB unit provides 28,400 channels spaced at 1 KHz intervals derived from a high stability synthesizer. Channels selected by 5 in-line switches have a locking time of less than 2 seconds and remain stable to within 1 ppm at 25°C. Frequency changing is facilitated by channel control illumination provided by tritium-powered "Beta Lights" without battery drain. A search control provides continuously variable coverage between the 1 KHz channel spacing.

Designed primarily for USB or LSB operation 'SYNCAL 30' can also be used for AM and CW. High and low switch settings provide output levels of 20 and 5 watts P.E.P respectively for SSB and CW operation. A single antenna matching control and tuning meter are used to insure peak efficiency. Antenna connectors will accommodate a dipole, 8 ft. whip or a long wire antenna. Provisions are also available for two station intercom operation when the unit is not functioning as a transceiver.

An operational unit including handset, whip antenna, NiCad battery pack, haversack and carrying frame weighs only 24 lbs.

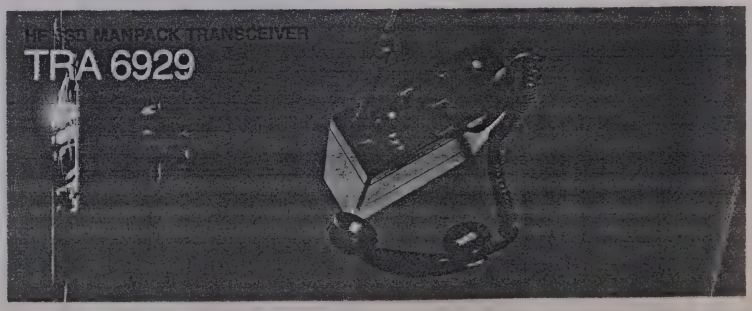
- 1.6 to 30 MHz synthesizer control
- 28,400 discrete channels
- 20 watts P.E.P.
- USB/LSB/AM—Voice or keyed tone
- Better than 1 ppm stability



Lightweight and simple to operate, the TRA 6929 'MINICAL' provides maximum range communications, operator mobility and battery economy. Only a few minutes of instructions are required to facilitate operation by unskilled personnel. A single control for antenna loading, combined with a high efficiency antenna circuit ensures maximum radiated power of 1 watt P.E.P. Depending on the time of day and choice of frequency, ground-wave ranges up to 8 miles may be expected using the regular 6-foot whip antenna. For increased range, a dipole antenna may be installed using an adapter. Regular battery supply consists of 9 Type D or U2 cells. A rechargeable nickel-cadmium battery pack and recharger unit is also available. With the Ni-Cad battery pack, power output is increased significantly.

'MINICAL' is supplied as a complete ready-to-operate unit. It is aligned to the customer's choice of sideband frequencies and includes battery box, 6-foot whip antenna, handset, shoulder-slung haversack, instruction plate and operators manual.

- 6 channel operation
- 2 to 7 MHz (TRA6929A)
- 2.6 to 9 MHz (TRA6929B)
- 1 watt P.E.P.
- CW, AM, SSB (upper and lower)



Battery Packs and Chargers

The MA6987 Solar Battery Charger has been primarily designed for use with the Racal MA6982 series of nickel cadmium battery packs, used with the PRC-25 and PRC-77 radio sets. With the proper connector or adapter, it may also be used with any 12V nickel cadmium battery.

The MA6987 is designed to be stowable in the applicable manpack radio haversack, and with its own stand and built-in light meter can be readily oriented toward the brightest portion of the sky whether the sun is shining or not.

The rugged, brushed Lexan® cover over the 40 nonreflective coated solar cells protects the unit from rough handling and damage that would be anticipated in field use.

Solar Battery Chargers use the energy of the sun and eliminate the need to carry the additional weight of either a hand-crank generator or a portable charger (which would require some power source to operate). Solar Chargers are, therefore, particularly adaptable to long range patrols operating in remote locations where no other power is available and where the additional weight and [illegible] hand-crank generator are not desired.

Output. Essentially constant current, 460 milliamps minimum at 17.2 volts for normal sunlight conditions.

Metering. Indicates relative charging current, enables positioning of unit for maximum output.

Size. 11″ x 11.5″ x 1″

Weight. Approximately 4 lbs.

Environment. Operating temperature −40°C to +60°C; full performance after prolonged submersion.

Adapters. AA6988 adapter enables the series connection of two MA6987 units to charge 24 volt batteries; other special purpose adapters available on request.

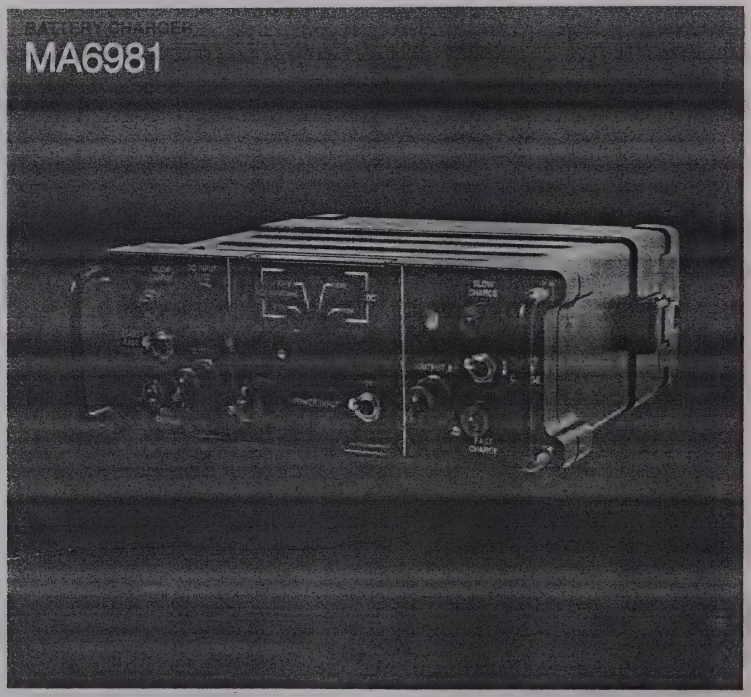
Battery Packs and Chargers

The MA6981 Dual Supply Charger was designed to satisfy the increasing demand for a Supply-Charger for use with the AN/PRC-25 and AN/PRC-77 and for Racal's Syncal, Squadcal and Comcal series of transceivers. The unit consists of a unique two section (automatic) charger and interconnecting cables. Some typical methods of operation are illustrated on page 23.

Each section of the MA6981 Dual Supply Charger provides an independently regulated charging rate as determined by the condition of the battery pack being charged. For example, a considerably discharged battery pack may be recharged for 2 hours at a fast rate and then will be automatically switched to the slow rate. Indicator lights show which charging rate is being used. Both the battery pack and the charger are protected by a current sensing circuit which monitors and limits the current output even under shorted conditions.

Interconnecting cables are provided in a storage case which forms the base of the charger. These cables facilitate connection to a variety of power sources such as 12/24 V vehicle batteries, 115/230 VAC sources and hand-crank generators.

- Eliminates expensive throw-away-batteries
- Maintains maximum transmitter output
- Manpacks operable while charging
- Automatically changes from fast to slow rate
- Two independently regulated sources
- Operates from 12/24 VDC or 115/230 VAC



TECHNICAL DESCRIPTION

■ The antenna circuit, protected by a fuse and a lightning arrester, is fed via an attenuator, variable in four equal steps, to a switched filter system at the input of the RF amplifier.

■ This filter includes an RF range switch to select any one of five tuned bands to cover the frequency range of the receiver and an additional restricted tuned range (300-500 kHz). Two wide band ranges of 3-500 kHz and 3-980 kHz respectively are also available. The filter is preceded by a 1 MHz low pass unit to restrict the input frequency range to that of the converter; an additional unit with a 500 kHz cut-off is introduced when operating below 500 kHz.

■ The RF amplifier is coupled through a further 1 MHz low pass filter to a balanced mixer. This mixer is fed with a 3 MHz signal derived from the 1 MHz reference oscillator of the associated receiver by use of a harmonic generator and produces a resultant output signal in the range 2.02-2.997 MHz.

■ This signal is fed via a 2-3 MHz band-pass filter to an amplifier to increase its level and thence to the interpolation receiver section of the associated receiver. Tuning therefore involves selection of the required signal by the kHz tuning control of the receiver and preselection (if not in wide band condition) by use of the converter antenna tuning control.

■ Power for the converter is derived from the associated receiver.

TECHNICAL SPECIFICATIONS

(The use of a Racal RA.217 series Receiver is assumed where applicable)

INPUT FREQUENCY RANGE:
3-980 kHz

INPUT IMPEDANCE:
75 ohms nominal

INPUT VSWR:
2:1 or better

OUTPUT IMPEDANCE:
200 ohms or less (Normal output load 2000 ohms opprox.)

GAIN:
50 dB nominal gain from antenna to output socket (loaded)

INPUT PRESELECTION:
a) Double tuned circuits in five ranges:
3- 10 kHz
10- 30 kHz
30-100 kHz
100-300 kHz
300-980 kHz
b) 300-500 kHz (tuned) with 500 kHz low pass filter
c) Wide band with 500 kHz low pass filter
d) Wide band with 1 MHz low pass filter

INPUT ATTENUATOR:
40 db in 10 dB steps

SENSITIVITY:
100-980 kHz, 3 kHz bandwidth:
0.5 microvolts CW for 15 dB S/N ratio
3-100 kHz, 200 Hz bandwidth:
0.5 microvolts CW for 15 dB S/N ratio

LOCAL OSCILLATOR LEAKAGE
a) To output: Less than 30.0 millivolts (3 MHz) under all conditions
b) To antenna: Less than 5 microvolts (3 MHz) with input termination of 75 ohms

AGC:
Control range at least 80 dB

1 MHz INPUT:
Not less than 65 millivolts into 100 ohms (available from receiver)

POWER SUPPLIES:
– 16 volts (stabilized) from receiver

OTHER CHARACTERISTICS:
Generally as for receiver

ENVIRONMENTAL CONDITIONS:
Operating: 0°C to 55°C
Storage: –40°C to 70°C

DIMENSIONS:
RA.6337M: 1¾" high x 5½" wide x 16" deep
RA.6337A: 1¾" high x 19" wide x 17" deep
RA.6337A-1: 3½" high x 19" wide x 17" deep
RA.6503: 3½" high x 19" wide x 17" deep

WEIGHT:
RA.6337M: 5 pounds (approx)
RA.6337A: 5 pounds (approx)
RA.6337A-1: 6 pounds (approx)
RA.6503: 19 pounds (approx)

RACAL
COMMUNICATIONS, INC.
5 RESEARCH PLACE, ROCKVILLE, MARYLAND 20850
PHONE: (301) 948-4420 • TELEX 898-456 • CABLE RACOMINC

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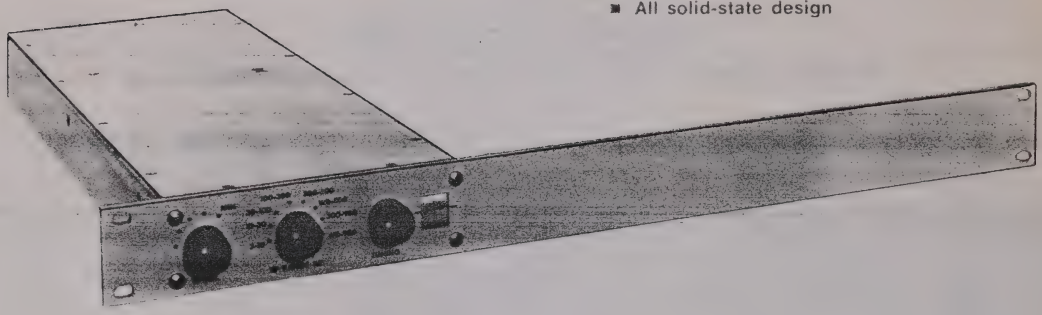
LOW FREQUENCY CONVERTER | RA6337

OUTSTANDING FEATURES

- Frequency Range from 3 kHz to 980 kHz
- Protected against antenna overload
- Tuned pre-selection or wide band operation
- Does not affect HF receiver performance
- All solid-state design



1¾" x 19" x 16" 5 pounds

■ The RA.6337 Low Frequency Converter has been specially developed for use with the Racal RA.217 series of HF Communications Receivers (which in addition to the RA.6217, includes RA.217, RA.1217, and RA. 1218 units) to extend the frequency coverage from 980 kHz down to 3 kHz. The unit is designed to combat the effects of cross-modulation, intermodulation and blocking from high-power broadcast stations. Additionally, the unit is particularly effective in minimizing interference in LF reception.

■ The performance of the associated receiver is not impaired by the presence of the LF converter which may be left permanently connected. Changeover to LF operation is automatically effected by the LF setting of the MHz control (i.e. 00) of the receiver.

■ The input circuits employ double-tuned band-pass filters which cover the frequency range in five bands. These are manually tuned using a frequency-calibrated drum-indicator operated by a slow motion drive. In addition, wide band input circuits can be selected incorporating filters to attenuate broadcast band interference. The input circuits incorporate protection against damage by high level signals and lightning surges.

■ The converter produces an output spectrum of signals within the range 2 to 3 MHz which is fed to the interpolation section of the associated receiver; the desired signal is then selected by means of the kHz control.

■ The basic RA.6337M unit occupies less than half rack-width. The standard version RA.6337A is mounted on a 19 inch panel 1¾ inches high. An optional version RA.6337A-1 mounted on a 3½ inch panel includes a framework to permit equipment slides to be fitted. The RA.6337 is available combined with an RA.6366 Panoramic Adapter in the RA.6503 Converter/Display Unit.

RACAL

COMMUNICATIONS, INC.

Publication No. 235U1

RA6790 MF/HF Receiver

The RA6790 represents Racal's new generation of low cost high performance synthesized digitally-controlled receivers designed for modern HF communications/surveillance applications. The receiver combines Racal's excellent and time proven HF technology with built-in microprocessor based control of all receiver functions and a patented single loop digital LO Synthesizer. The RA6790 is designed to be used either in the manual mode (front panel controls) or remotely controlled. All receiver functions, including both operating commands and receiver status, are available at the remote device. The RA6790 Receiver provides excellent performance characteristics in addition to covering the 500kHz-30MHz frequency range in 1Hz tuning increments either from the front panel keypad, tuning wheel encorder, or from a remote controller. A very important feature of this receiver is its ability to be configured for master/slave operations.

Features

- Frequency range from 500 kHz to 30 MHz
- 1 Hz tuning increments
- AM, FM, CW, USB, LSB reception modes standard; ISB optional
- 455 kHz second IF output
- Internal 5 MHz frequency standard (±1 part in 10^6)
- Selectable 1, 5, or 10 MHz reference input or output
- All receiver functions may be remotely controlled-Serial or parallel, EIA or MIL interface
- Easy-to-read liquid crystal display
- BFO tuning range of ±8 kHz in 10 Hz increments — pushbutton for immediate zero reference
- Front panel pushbutton selection of all receiver functions
- Six selectable bandwidth filters plus wideband (16 kHz) filter
- Three selectable AGC time constants
- Fully modular construction for simplified maintenance
- Direct module replacement without realignment

Options

- Extended low end tuning 10kHz-30MHz
- ISB Module
- Variable rate tuning
- Selectable plug-in bandwidths
- Blank front panel remote control only
- RF Amplifier for improved sensitivity
- Broadband IF output
- Improved internal frequency standard, 1 part 10^8
- LED frequency readout
- Audio squelch control
- EIA Standard RS232-C Compatible Digital Interface
- IEEE Standard 488 Compatible Digital Interface
- Other I/O available upon request

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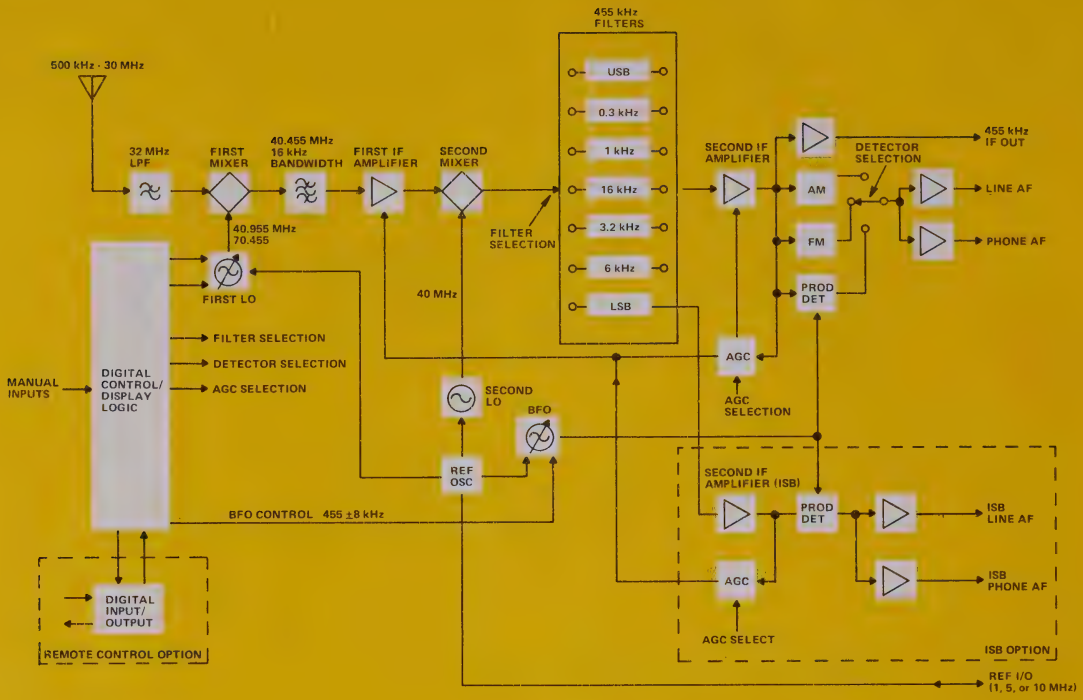

Functional Description

The simplified block diagram illustrates the principal circuits contained in the RA6790 Receiver. The frequency selection information, from the front panel keypad or the tuning wheel encoder, is brought through the digital control/display logic module to the first LO module. The output signal (with a range of 40.955 to 70.455 MHz) is applied to the mixer to derive the first IF of 40.455 MHz. This output is filtered, amplified, and combined in the second mixer with the second LO frequency of 40 MHz to derive the 455 kHz second IF.

The second mixer output is brought through the selected filter, amplified, and applied to the detector circuits. The selected detector output is brought through two separate output amplifiers and applied to the front panel headphone jack and to the rear panel audio output connector. The second IF amplifier output is also applied to the 455 kHz output amplifier and to the AGC detector/control circuit.

The filter/detector/and AGC selection commands from the front panel pushbuttons are brought through the digital control/display logic module and applied to the appropriate selection control circuits. When the receiver is operated from a remote control device, the optional digital I/O module receives the command word from the remote device and provides the required commands to the digital control/display logic module.

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T.O. 33AA21-5-31E

SUPPLEMENT

TEST DATA FOR ELECTRON TUBE TEST SETS
TV-7/U
TV-7D/U

THIS PUBLICATION SUPPLEMENTS T. O. 33AA21-5-31 DATED 17 JANUARY 1962.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

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1 DECEMBER 196

1. PURPOSE.

This Supplement is issued to incorporate additional Electron Tube Test Data.

2. INSTRUCTIONS.

Page 22, following test information listed for tube type 6BW6 add: If short indication is obtained on positions 1, 2, 3 and 5 on shorts test, use the following selector settings: EV1-7839. All other settings remain the same.

Page 24, following test information listed for tube type 6CHC add: If short indication is obtained on positions 2 and 3 on shorts test, use the following selector settings: EV2-7831. All other settings remain the same.

Additional Electron Tube Test Data follows.

AF Olmsted Apr 66, 8M

Frequency Range
500 kHz to 30 MHz

Internal Spurious Responses
Not greater than 3 dB above noise level in a 3 kHz

The R–217A(P)/URR receiver provides HF intercept and communications coverage over the frequency range

weighs 14.5 kg and operates from 115/230 V AC 48–420 Hz. It meets MIL-STD–461 for RFI/EMI.

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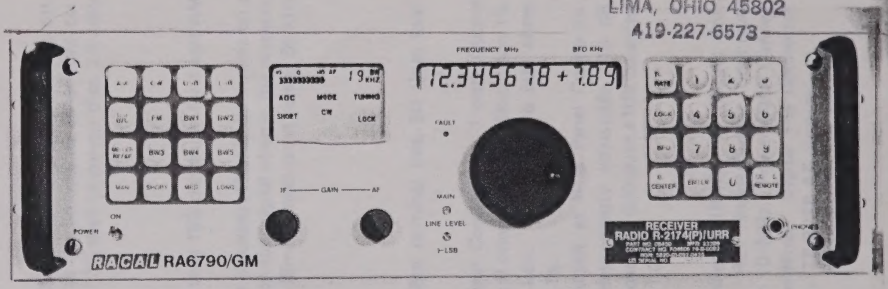
R–2174B(P)/URR ELF-HF Intercept and Communications Receiver

The R–2174B(P)/URR is an expanded frequency receiver covering the frequency range 1 kHz to 30 MHz. General operating characteristics and specifications are based on the R–2174A(P)/URR HF receiver. The receiver also provides a DC-coupled AM and FM demodulator and a 15 kHz IF frequency convertor. The receiver measures 133 × 483 × 470 mm, weighs 14.5 kg and operates from a 115/230 V, 47–420 Hz, AC supply.

Manufacturer
Racal Communications Inc, Rockville, Maryland.



R–2174B(P) receiver

R–2412/U VHF/UHF Receiver

The R–2412 receiver is designed to meet a number of military surveillance applications. It has a frequency range of 20 to 1200 MHz and is capable of detecting AM, FM, lower sideband and upper sideband transmissions and can scan as many as 50 frequencies per second. It can be programmed for up to 100 pre-selected channels and signals can be 'handed off' to slave receivers if required. It can be duplicated in a 483 mm rack allowing 200 pre-selected frequencies and the scanning of up to 100 frequencies per second. The receiver meets Mil STD 810 environmental requirements, measures 133 × 487 × 558 mm and weighs 22 kg.

STATUS
Several hundred on order for the US Navy.

Manufacturer
Cubic Corp, San Diego, California.

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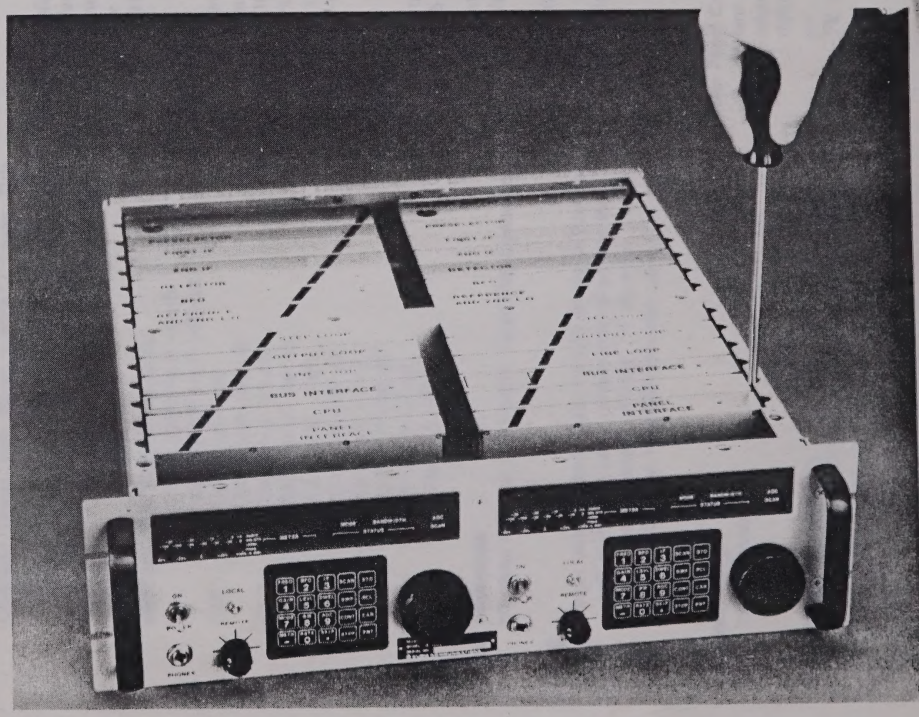
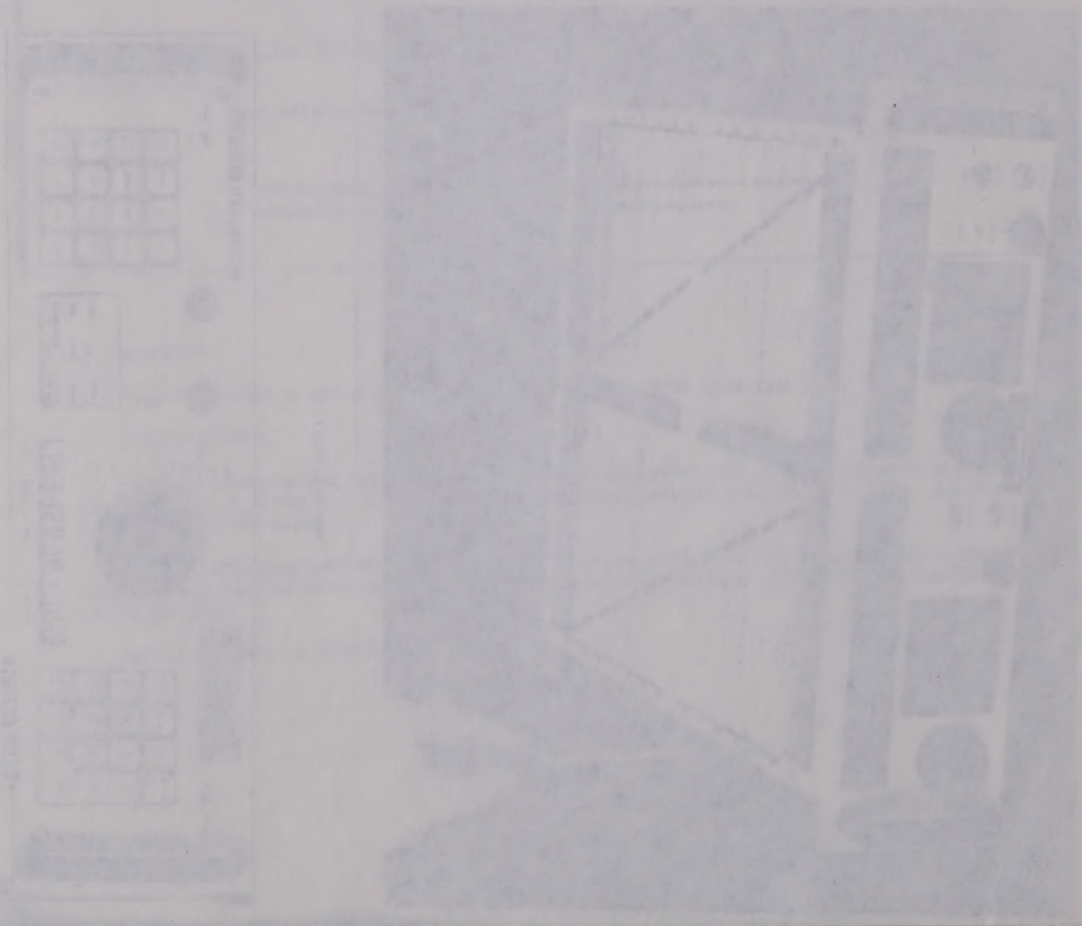


R–2412/U receiver



Technical Specifications

Frequency Range
500 kHz to 30 MHz.

Frequency Selection
1 Hz increment.

Frequency Tuning
By keyboard entry or continuous tuning with selectable rates, FAST (100 Hz), SLOW (10 Hz), and FINE (1 Hz) increments. BFO continuous in 10 Hz increments.

Frequency Indication
(a) 8 digit electronic readout of tuned frequency to 1 Hz.
(b) 3 digit and sign readout of BFO relative to IF center ±8 kHz.

Frequency Stability
±1 part in 10^6 using internal 5 MHz reference oscillator. Provision for an external 1, 5 or 10 MHz reference input/output. 0 dBm nominal into 50 ohms.

Modes Of Operation
USB/A3J Upper Side Band; LSB/A3J Lower Side Band; ISB/A3B Independent Side Band (optional); CW/A1 Continuous Wave; AM/A3 Amplitude Modulation; FM Frequency Modulation.

Selectivity

SSB/ISB:	(3.24 kHz bandwidth)
	>250 to 3200 Hz @ –6 dB
	<400 to 4300 Hz @ –60 dB
CW1:	>300 Hz @ –3dB
	<3000 Hz @ –60 dB
CW2:	>1000 Hz @ –3 dB
	<6000 Hz @ –60 dB
AM1:	>3.2 kHz @ –3 dB
	<12 kHz @ –60 dB
AM2:	>6.0 kHz @ –3 dB
	<20 kHz @ –60 dB
AM3:	>16 kHz @ –3 dB
	<50 kHz @ –60 dB

Input Impedance
50 ohms nominal, 2.1 VSWR; Type BNC Connector.

AGC
Range: An increase in input of 110 dB above 2 microvolt will produce an output change of less than 3 dB. Time Constants Attack: < 20 msec. Decay: Short < 30 msec; Med 200 ±50 msec; Long 4 ±1 sec.

Dynamic Range
120 dB minimum.

Image/Spurious Rejection
80 dB, 20 kHz or more removed from tuned frequency.

Internal Spurious Responses
Not greater than 3 dB above noise level in a 3 kHz bandwidth.

Reciprocal Mixing
The apparent noise appearing at the receiver input when in a 3 kHz bandwidth, caused by a 0 dBm signal 100 kHz off tune shall be less than 1.0 μV (–107 dBm).

Sensitivity (500 kHz to 30 MHz)
SSB. 0.5 μV (–113 dBm) for 10 dB S + N/N ratio.
AM. 2.5 μV (–99 dBm) 30% modulated for 10 dB S + N/N ratio in 6 kHz bandwidth.

Intermodulation (In Band)
Better than –50 dB for –10 dBm input signals when measured at the IF or line AF output.

Intermodulation (Out of Band)*
Third order intercept point greater than +30 dBm. Second order intercept point greater than +60 dBm.
*Below 1.5 MHz these limits may be exceeded.

Cross Modulation
The level of a 30% modulated signal, 50 kHz off-tune, necessary to cross-modulate an on-tune carrier to a depth of 3% shall be greater than 2.5 volts (+21 dBm).

Blocking
(a) On Tune: less than 10% distortion for 1 volt AM input signals.
(b) Off Tune: No blocking effect is discernible on a 30% modulated on-tune signal when in the presence of a 3-volt (+23 dBm) unmodulated carrier 50 kHz off-tune.

Outputs
IF Output:
455 kHz, –10dBm nominal into 50 Ohm load.

AF Output:
(a) Rear Panel Connectors: 1 watt, Output Impedance 8 ohms nominal. Distortion 1%.
(b) Phone Jack: 10 mW into 600 ohms, Distortion 1%.
(c) Line Output at Rear Panel Connector: 1 mW independently adjustable ±10 dB. Output Impedance 600 ohms ±10% balanced. Distortion 1.0%.

Rear Panel Connectors
Antenna Input Connector (BNC). IF Output Connector (BNC). REF Input/Output Connector (BNC). 1, 5, or 10 MHz. Power Input Connector. Ground Terminal. Digital I/O Connector. TB 1-AF outputs. TB 2-ISB AF outputs.

Remote Control (Optional)

Full remote control of all receiver parameters by either (1) serial asynchronous, character oriented data at 9.6 or 19.2 kilobauds, selectable MIL-STD-188C or EIA Standard RS 232-C compatible, (2) byte-serial bit-parallel IEEE Standard 488-1975 compatible, or (3) other, user specified, interface formats.

Status Indication

Front panel indication of status under local and remote control, remote indication of status under local or remote control.

Front Panel Controls and Indicators

Frequency control keyboard. kHz/BFO frequency control (rotary). Tuning selector key (FAST/SLOW/FINE), LOCK and BFO with LCD indicators. MHz/kHz 8 digit decimal display. BFO 3 digit decimal display with sign. AGC selector key, SHORT, MEDIUM, and LONG with LCD indicators. MODE selector key USB, LSB, ISB, CW, AM and FM with LCD indicators. FILTER selector key 0.3, 1.0, 3.2, 6, and 16 kHz with LCD indicator. LOCAL/REMOTE Key with LCD indicator. AF GAIN control. RF GAIN control. METER Switch AF/RF AF Level Line level pre-set control. PHONES jack. POWER switch.

Environmental

(a) Operating Temperature: 0^{o} to $+50^{o}C$
(b) Storage Temperature: -40^{o} to $+71^{o}C$
(c) Humidity: 10% to 95% at $40^{o}C$
(d) Bench Handling: MIL-T-4807, Method 4A.
(e) Vibration: MIL-T-4807 - MIL-STD-810B, Method 514, Procedure X1, Part 1.
(f) Altitude: Operation to 10,000 ft.

Primary Power

115/240 Vac ±10%, 48 – 420 Hz, single phase.

Power Consumption

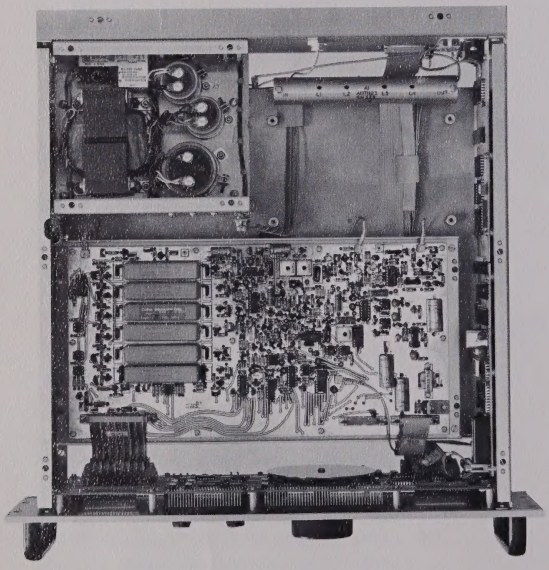
50 watts (nominal).

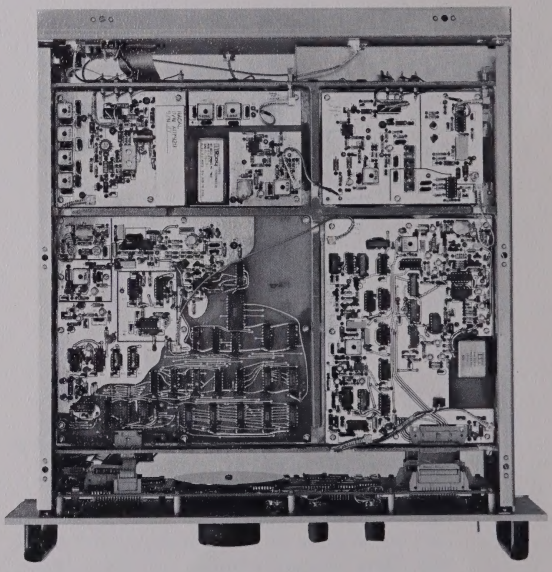
Dimensions

Suitable for 19 in. (48.3 cm) rack or desk top console mounting. Height: 5-1/4 in. (13.33 cm); Width: 19 in. (48.3 cm); Depth: 18.75 in. (47.6 cm).

Weight (Approx.)

30 lbs. (13.5 kg.)





Modular construction simplifies maintenance procedures. Top view is shown on left; bottom view on right.

RACAL
COMMUNICATIONS, INC.
5 Research Place, Rockville, Md. 20850 (301) 948-4420 Telex 898-456 Cable RACAL USA

The RACAL policy is one of continous improvement, and consequently the equipment may vary in detail from the description and specification in this publication.